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EIGHTH MENDELEYEV CONGRESS ON GENERAL AND APPLIED CHEMISTRY

- USSR -

by L. K. Simonova and M. I. Kurochkina

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From 16 to 23 March in Moscow there was a session of the Eighth Mendeleyev Congress which was a review of the development of theoretical and industrial chemistry in our country. This Congress differed from the preceding ones in the diversity and great timeliness of subjects, in the multitude of reports submitted, and in the great number of members present. Not only chemists of all branches participated in it, but also representatives of sciences related to chemistry: physics, biology and agriculture. There were 2,230 official delegates at the Congress, but on certain days the number of listeners reached 10 to 11 thousand.

At the Congress arrived 200 foreign chemists, many of whom took an active part in its work. Foreign scientists presented more than 50 papers.

The Eighth Mendeleyev Congress was called soon after the 21st Congress of the Communist Party of the Soviet Union, which confirmed the Seven-Year Plan for the further development of the national economy of our country; and many works by the participants in the Mendeleyev Congress were aimed at the practical realization of the decisions of the 21st Congress of the CPSU.

Great attention was paid to problems touching upon the preparation of synthetic products, the synthesis of organic compounds from natural gases, petroleum processing of new types of mineral raw materials; to problems in the production of mineral fertilizers, the chemical means of plant protection, the building of chemical equipment, automation, and to many other problems of chemical science and technology.

The Congress reviewed the work of Soviet physical chemists, which covered studies on the structure of matter, on kinetics and the catalysis of chemical reactions, the chemistry of complex compounds, radiochemistry, sorption

and surface phenomena, and corrosion.

The work of the Congress went on in meetings of 17 sections(inorganic chemistry and technology; organic chemistry and technology; analytical chemistry; physical chemistry; colloidal chemistry; chemistry and technology of polymers; chemistry of natural compounds and biochemistry; agronomic chemistry; fertilizers, insecticides,fungicides; chemistry and chemical technology of fuels; chemistry and technology of food products; radiochemistry and chemistry of isotopes; theoretical and applied electrochemistry; chemistry of metals and alloys; economics, planning and organization of chemical production; basic processes and equipment of chemical technology). In addition, a symposium on higher chemical and technological education, and on chemical nomenclature was meeting.

Eleven papers were submitted in plenary meetings and about 1,500 at section meetings.

It is impossible in a short article to characterize -- even superficially -- the multifareous and diversified work of the Eighth Mendeleyev Congress. In the present article we deal with such papers as might be of special interest to the readers of the Journal of Applied Chemistry.

In the Plenary Meeting leading scientists of our country presented papers on the latest achievements in the area of chemical sciences.

A. N. Nesmeyanov presented an address on the subject: "The Mendeleyev Periodic System of Elements, and Organic Chemistry" in which he acquainted the listeners with general laws governing the characteristics of organometallic and nonmetallic compounds.

A central position in all the diversity of their structures is occupied by hydrocarbon (alkyl, aryl and others) derivatives having a chemical bond between a carbon and another atom. D. I. Mendeleyev paid them considerable attention in his basic articles on the establishment of the periodic law.

Alkyl groups establish a somewhat stable bond with other elements at s-p valence levels only. The presence of unused d and f valence electrons greatly weakens the stability of obtained alkyl derivatives, makes them atypical, nonvolatile,like tetramethyl patinum, or prevents their formation altogether (the explanation proposed, by the author, of one of the laws described by D. I. Mendeleyev).

All possible structures of carbon compounds with all other elements represent a boundless area of a new, rapidly growing organic chemistry of all elements of the periodic system, different from the old organic chemistry of organic elements.

Into this new organic chemistry overflows the elemento-organic chemistry, again synthesizing the two branches of chemistry which were separated 150 years ago -- the organic and inorganic.

V. I. Spitsyn made a review of the present state of D. I. Mendeleyev's Periodic Law, of its developmental stages, of the ever widening areas of its application, including a deeper understanding of the theory of atomic structure and the discovery of new radioactive elements.

V. S. Fedorov reported on the aims of scientific and technological progress in chemical industry; V. A. Kargin, on the basic problems of polymer chemistry.

N. N. Semenov submitted a report on the subject: "Basic Problems of Chemical Kinetics." In this report, important results of modern research concerning the rate of chemical reactions are reviewed, as well as their importance for both theoretical studies of the mechanics of reaction and chemical technology.

In a paper on basic problems of radiochemistry A. P. Vinogradov reported on the trends in the development of the use of radioactive isotopes and nuclear radiations for the synethesis and polymerization of organic compounds, in medicine and in other areas.

V. A. Engelhardt read a paper dedicated to basic problems in biochemistry and showed that, in the light of latest research, one can give chemical mechanisms for the most important vital processes, and in so doing, help medicine in its fight against certain severe diseases.

Chemical problems in agriculture in the USSR were reported in A. V. Sokolov's paper. Based on the volume of mineral fertilizer production as foreseen in the Seven-Year Plan (35 million tons in 1965), one can expect a considerable increase in many agricultural crops. The use of new chemicals in agriculture (insecticides, fungicides, herbicides, and defoliants) will greatly induce increased crops.

Ya. K. Syrkin made a report on the present state of the theory of valency. The accumulation of new experimental material requires a further development and widening of the science of valency. This development is, in the first place, connected with new data on the full utilization of non-coupled valency electrons, nonlimited electron pairs and empty orbitals, which lead to the formation of bridged connections, dimers, trimers and other compounds. An ever growing importance is acquired by three-, four -, and multi-center orbitals, when an electron pair moves in the field of three, four and more centers. Because of this /mechanism/ such compounds are obtained in which, for example, the CH_3 group or the hydrogen atom is simultaneously

attached to several neighboring atoms.

These new types of bonds play a great role in catalysis. In recent times new compounds have been synthesized the structure of which can be understood only in the light of molecular orbitals. This generalized theory encompasses all types of bonds, from ionic to covalent, in the most varied types of compounds; and bicentral bonds are included as an important but particular case. This /theory/ developes successfully and permits the prediction of properties in a series of cylic organic molecules with conjugate bonds. The theory explains in a more satisfactory way than before the nature of bonds in complex compounds.

Chemical propsects for the utilization of atomic energy were reviewed in a report by A. P. Aleksandrov, in which the ways of using atomic energy in chemical technology were indicated.

V. B. Nikolayev made a report on the basic aims of building chemical equipment and machinery, in which he indicated a series of new principles and types of highly productive equipment for chemical industry.

In the sessions of the section for inorganic chemistry and technology 100 papers were submitted, covering different areas of chemistry. Communications concerning the study of peroxide compounds attracted great interest.

I. A. Kazarnovskiy (Moscow) reported on the mechanisms of forming peroxides and on their oxidizing power. By using tagges oxygen, the mechanism of oxidizing barium oxide to peroxide was studied; a magnetic method was used for a study of the spontaneous decomposition of solid hydroperoxide K_2O_2-$2H_2O_2$; and, finally, the reaction of potassium ozonide with heavy water was studied. It was shown that in all three types of peroxides, the carriers of oxidizing action are free hydroxyl radicals. Enormous differences in the intensity of this action are caused chiefly by different concentration of hydroxyl radicals which, in the case of ozonides, are higher by several orders than those of Fenton's reagent.

S. Z. Makarov (Moscow) studied perhydrate forms of metal peroxides in the I and II groups of the periodic system. The results obtained confirm the fact that perhydrates of subsidiary sub-groups (as well as of lithium and magnesium) peroxides belong to hydroperoxides forms. The capacity of hydroperoxides of I group metals to form superperoxides by their dehydration was established.

I. I. Vol'nov (Moscow) worked out the conditions for a reproduceable preparation of calcium, strontium and barium peroxides from peroxide diperoxyhydrates.

T. V. Rode, G. K. Grishenkova and A. V. Zachatskaya (Moscow) studied the interaction of peroxide and superperoxides of sodium with sodium carbonate and hydroxide. The study was carried out with the help of physicochemical analysis (thermographic, thermogasovolumetric, radiographic and chemical).

I. N. Lepeshkov (Moscow) in his report discussed the new studies in N. S. Kurnakov's school covering the physicochemical analysis of natural salts and water-salt equilibrium.

Considerable attention was attracted lately to the physical and chemical characteristics of new salt deposits in the Southern Urals, Krasnoyarskiy Kray, Belorussia and other regions of the country. A study continued on the hydrochemical regime of the greatest salt basin in the world, Kara-Bogaz-Gola. New data were obtained concerning the content of lithium and boron in natural lyes and salts, as well as of other elements being important for the new technology; and a series of water-salt systems containing Na, K, Mg, Ca, Li and Rb salts were studied at different temperatures.

Together with laboratory work, field research was carried out including larger experiments in the basins. Plans for further research in this area were drawn up.

S. I. Volfkovich, N. N. Postnikov, L. A. Yonass, V. V. Illarionov and R. E. Remen (Moscow) devised a new thermal process for the intensive elimination of fluorine from non-dressed Khibinsk apatite-nepheline ores and Kara-Tau phosphorites by steam at melting temperature. This /process/ results in fertilizers containing phosphates assimilable by plants, while fluorine gases are eliminated. Kara Tau phosphorites containing magnesium are successfully processed following this method without any additives. The process is carried out in a cyclone type of intensive furnace. The product is a concentrated fertilizer and a fodder substance for animals.

The chemistry of complex compounds was covered in the section by a series of papers.

I. I. Chernyayev, L. A. Nazarova and V. S. Orlova (Moscow) succeeded in forming sulfates, nitrates and carbonates of platinum iodopentamine by ammonia substitution of the hydroxo group in platinum trans-iodohydroxotetramine. Facts observed by them in their work are easily explained by the admission of a great trans-influence of iodine.

A. A. Grinberg (Leningrad) brought in new data on the Kinetics of complex formation and on the stability of complex compounds. A study of isotope exchange kinetics in complex Pt, Pd and Ir compounds, as well as of data on substition kinetics in complex platinum compounds, and of instability constants of corresponding compounds, leads to the general con-

clusion that the chemical behavior of complex compounds is determined not by thermodynamic characteristics alone, but also by the speed with which equilibrium is established. In a series of cases thermodynamically more stable complex compounds enter much more rapidly into exchange and substitution reactions.

A great number of papers dealing with complex compounds concerned the study of the chemistry of the rare elements.

O. Ye. Zvyagintsev, A. Kurbanov, S. M. Starostin (Moscow) investigated nitroso-compounds of ruthenium; S. I. Ginsburg, N. K. Pshenitsyn and L. G. Sal'skaya (moscow) studied the nature of colored iridum compounds formed in sulfuric, phosphoric and perchloric acids; Ye. V. Shenderetskaya and I. I. Chernyayev (Moscow) studied formates of monovalent rhodium; E. P. Deichman (Moscow) studied the composition and properties of indium oxalate and of its compounds with oxalates of alkali metals; M. D. Lyutaya and I. V. Tanayev (Moscow) carried out an investigation of the preparation, composition and properties of mixed hexanitronickelates of rare earth elements. Z. A. Sheka and Ye. Ye. Kriss studied the extraction of La, Nd, Y, and Yb nitrates from nitric acid solutions by means of tributyl and dibutylphosphates in CCl_4, as well as the complex-forming processes in these systems.

About 30 papers were presented at the meetings of the section on the agronomic chemistry of fertilizers and insecticides and fungicides. One of the meetings was opened by the eldest organic chemist, head of the Russian School of phosphoro-organic chemists, A. E. Arbuzov. B. A. Arbuzov (Kazan') reported on the results of the work by the Kazan Chemical Institute, AS USSR, for finding new means of combating plant pests. Most interesting was a mixed diethyldimethyl ester of dithiopyrophosphoric acid. A series of acyl derivatives of dipterex was prepared, and their insecticidal and toxic properties studied. Acylation of dipterex by organic acids lowers its toxicity for warm-blooded animals and only slightly affects its insecticidal properties.

S. I. Volifkovich (Moscow) presented a report on his work conjointly with a group of collaborators of Moscow State University researching new types of highly concentrated complex certilizers free of useless components. The addition to potassium, ammonium and magnesium phosphates of small quantities of salts combined with heating produces polymer fertilizers with different degrees of solubility and, consequently, different rates of food assimilation by plants.

An interaction of carbamide with paraform, urotropine, phosphates and other substances forms polymers, durable-action fertilizers which are not leached out by rain or

irrigation waters into the subsoil.

M. Kh. Chaylakhyan (Moscow) reported on "hibberelines" as new growth activators. Hibberelines stimulate plant growth, interrupt the dormant period of tree buds as well as that of bulbs and tubers, cause and hasten blooming, fruit ripening and germination. In the Soviet Union and in other countries extensive tests of these substances are carried out so as to work out economically justifiable methods of influencing agricultural crops in regular production.

O. K. Kedrov-Zakhman (Moscow) with collaborators studied the action of molybdenum on different plants on turf and podzol and peat-marshy soils outside the black-earth belt of USSR. Conducted tests proved conclusively that the use of molybdenum fertilizers must be introduced into the agricultural production of the Soviet Union outside the black earth belt.

N. N. Mel'nikov (Moscow) made a communication concerning the synthesis and study of a large new group of phosphoro-organic insecticides and showed a series of interesting facts concerning their mechanism of action on insects. He also referred to the results of work covering a new method of preparing esters of dithiophosphoric acid and of dithiopyrophosphoric acid. These compounds are of interest for a study as to their use as insecticides, herbicides and defoliants.

In a report by F. V. Turchin (Moscow) new ideas were submitted on the mechanism of the biological binding of atmospheric nitrogen by the nodules on the roots of leguminous plants which play a tremendous role in nitrogen metabolism in agriculture.

By applying isotope methods F. V. Turchin and his collaborators showed that synthesis of fermentation of nitrogen compounds from atmospheric nitrogen is localized at the inner surface of a specific nodule tissue on the roots of leguminous plants, and that the primary product of this synthesis is ammonia, which is later utilized in the plants for the formation of aminoacids and proteins.

At the meetings of the section of silicate chemistry and technology more than 60 communications were submitted. Among them, a report by I. S. Lileyev and colleagues (Leningrad) must be mentioned. It contained a study of gallosilicates of alkali metals, conditions of their preparation and their analogies with aluminosilicates. The role of gallium in silicate chemistry was studied from the following points of view: (1) the synthesis of gallosilicates by sintering oxides Na_2O - Ga_2O_3 - SiO_2, (2) preparation of vitreous alkaline gallosilicates and study of their properties,

3) synthesis of gallohydrosilicates of sodium from aqueous solutions of sodium gallate.

A. M. Ginstling and A. D. Volkov (Leningrad) carried out an interesting theoretical and experimental investigation of the thermochemical decomposition of calcium sulfate in crystalline mixtures and obtained considerable experimental data characterizing reactions in systems $CaSO_4 + SiO_2$, $CaSO_4 + C$, $CaSO_4 + C + SiO_2$ and others.

G. V. Kukolev and K. A. Mikhaylova (Khar'kov) studied the influence of surface-active additives on the compacting of refractories during pressing and the properties of baked specimens, establishing that there is a considerable influence of elastic (reversed) afteraction on an increase in porosity of the specimen. As surface-active substances, fatty acids with seven to nine carbon atoms per molecule and sulfite alcohol slops were used.

P. P. Budnikov and V. G. Savel'yeva (Moscow) investigated barium monoaluminate as a binder for refractory cements. $BaO \cdot Al_2O_3$ was syntehsized from $BaCO_3$ and Al_2O_3. Chamotte and chromomagnesite were used as fillers for concrete preparation. Refractory concrete with a barium aluminate binder has less additional shrinkage than concretes of calcium cement and shows a less abrupt change of volumetric weight when heated.

N. I. Voronin, N. I. Krasotkina and V. A. Smirnova (Leningrad) confirmed the possibility of preparing high quality carborundum products with nitride binder by calcining the coke charge in an ordinary flame furnace.

In their work Ye. V. Matsynin and S. D. Okorokov (Leningrad) tested the binding properties of a vitreous form of portland cement clinker. Synthesized four-, five- and six-component melts were submitted to petrographic and radiographic tests, and their relative grindability, sulfate resistance, hydration rate and binding properties under different conditions of storage of samples were determined.

L. N. Rashkovich and Yu. M. Butt (Kraskovo) made a communication concerning a binder for autoclave processing of limesand products. Between three possible variants of interaction of components during setting of products, experiments confirmed the hypothesis according to which the interaction takes place in the solution. New formations crystallizing from the solution are less soluble than initial components. V. A. Tikhonov and L. G. Shpynova (L'vov) submitted data on changes in phase content of hydration products of portland cement aluminate components, as shown by thermal, microscopic, electron-microscopic, chemical as

well as by physicomechanical tests.

V. V. Vargin and G. O. Karapetyan (Leningrad) investigated absorption spectra, luminescence and photochemical properties of cerium-containing glass, which has high stability against ionizing radiations. Cerium was introduced in different concentrations into silicate, borate, borosilicate and phosphorous glasses of simple compositions. Changes occurring in cerium were determined from absorption spectra and luminescence, as well as from thermo-luminescence of the investigated glass. As a result of the investigation it was established that triand tetra-valent cerium are simultaneously present in the glass and that glass luminescence is activated by trivalent cerium.

A. I. Avgustinnik (Leningrad) treated the problem of the finely dispersed crystalline phase that is formed from the vitreous. Theoretical laws governing the process, as found by him, show a preponderant role played by a more orderly structure of groups which underwent concentration, structural and energetical preprocessing, this /finding/ being confirmed by the work of Ye. A. Poray-Koshits (Leningrad) on glass structure.

Ample experimental material obtained by nonradiographic and by ordinary radiographic methods shows a chemically inhomogeneous structure for many complex glass types.

Among 80 communications presented during the meetings of the section on theoretical and applied electrochemistry, we note these few. N. V. Nikolayeva-Fedorovich, O. A. Petriy and A. N. Frumkin (Moscow) carried out an interesting study of the polarographic behavior of halogen platinum complexes. M. A. Loshkarev, I. P. Chernobayev and B. I. Tomilov (Dnepropetrovsk) investigated the influence of intermediate reagents on the course of electro-chemical reactions was an endeavour to overcome one of the substantial drawbacks of electrode processes consisting in a slowdown caused by a slow diffusion or a high degree of irreversibility of the discharge. Because of intermediate reagents one overcomes the delay in the electrode process caused by kinetic difficulties. In such cases the intermediate reagents act as a catalyst of electrode reaction and decrease the degree of its irreversibility. The general process theory and the basic kinetic equations are applied to the solution of a series of interesting technological problems of hydrometallurgy and to the electrical synthesis of organic compounds.

K. M. Kartashova and A. M. Sukhotin (Leningrad) worked out a dynamic method for measuring electrode capacitance for the determination of zero charge potentials. It

was established that by this method one can study the influence of oxygen adsorbed at different potentials, as well as that of other surface-active substances on zero charge potential of chromium steel and other metals.

D. I. Semchenko and K. G. Il'yin (Novocherkassk) studied the electrochemical formation of higher oxygen compounds of chlorine. A comparison of experimental material as obtained from the electrolysis of chloride solutions with the experimental material obtained from the study of anode polarization of smooth platinum in the same solutions leads to the conclusion that electrosynthesis of alkali and alkali earth perchlorates is the result of simultaneous primary discharge of Cl^- and OH^- ions and of subsequent secondary chemical and electrochemical reactions.

D. N. Gritsan and D. S. Shuya (Kharikov) studied the influence of synthetic detergent and wetting agents on the electrodeposition of metals. It was established that the use of these substances as additives opens new possibilities in controlling electrodeposition and in improving the quality of electrolytic coating of metals.

N. T. Kudryavtsev, G. N. Smolenskaya, V. M. Karatayev and R. G. Golovchanskaya (Moscow) worked out the conditions for the electrolytic coating of titanium and of titanium plating /coatings/ which are of great importance for machine and instrument building.

M. F. Lantratov and A. F. Alabyshev (Leningrad) proposed a new low-melting electrolyte for the production of metallic sodium. They investigated the basic properties of a ternary electrolyte $NaCl-CaCl_2-BaCl_2$ and carried out prolonged electrolytic tests in an electrolyzer at 3,000 amp. This electrolyte permits the achievement of high yields.

The section on basic processes and equipment for chemical technology was organized for the first time at the Mendeleyev Congress, and it, attracted naturally, great attention both on the part of Soviet and of foreign scientists. During four days 75 communications were made at the section related basically to the following areas: (1) general problems and hydrodynamic processes, (2) heat processes, and (3) problems of mass transfer.

The direction of the work was determined by the report of the section leader A. N. Planovskiy (Moscow) containing characteristics of the state of, and of the developmental trends in, the science of processing and of equipment in chemical technology.

Important in principle and interesting were communications concerning problems of simulation theory, and they led to lively debates. Discussing the nature and methods of the theory of simulation, A. A. Gukhman (Moscow) reviewed

modern ideas on this method of quantitative study based on the principle that each problem has its characteristic variables within the scope of which it must be considered. When describing the general forms of using these variables, an important feature of the theory of simulation was underligned -- the simultaneous analysis of a process on a general and on a relative plane.

I. G. Romanov (Leningrad) showed interesting examples of how the theory of simulation can be applied to problems of chemical technology. The experience in applying the theory of simulation when processing experimental data, or describing hydrodynamic, heat, diffusion and chemical processes reveals the absence of a unified basic point of view on a system of simulation criteria. Many authors abuse /the concept/ by introduction of new criteria of simulation, the physical sense of which is not quite clear.

O. M. Todes and colleagues (Leningrad) submitted an analysis of experimental data obtained in a study of the hydrodynamics of a suspended /boiling/ layer. A universal dependence is derived as an approximation which ties together Re and A criteria and the porosity of layer, , applicable to both a boiling layer (from beginning of boiling to the removal of particles from the device) and restricted sedimentation of suspensions. I. P. Mukhlenov (Leningrad) indicated an absence of a complete analogy to processes in a suspension layer and systems of gas-liquid and gas-solid bodies, analyzing equations derived in studies of hydro-dynamics of a suspension layer.

S. Ya. Gzovskiy (Moscow) derived analytical dependences from his studies of stirring and, determined the power consumption for overcoming the interior friction of a liquid in a rotating stream, as well as formulas for determining forces acting on vanes, centers of force application, angular moment and power consumed by a mixer. I. S. Pavlushenko (Leningrad) introduced the concent of a "determining number of revolutions", by the use of which one obtains, on the one hand, the dependences between physicochemical properties of the dispersed phase and the dispersing medium, the geometric sizes of the device and of the mixer, and, on the other hand, the dependence of the number of revolutions required for a practically uniform distribution of phases in the volume being mixed.

Conclusions drawn by P. A. Semenov (Moscow) from experimental studies of mass exchange between gases and liquids are, in principle, of great importance for the further development of theoretical concepts of the mechanics of mass exchange between gases and liquids at their interface.

The results of work by M. L. Varlamov and his colleagues (Odessa) on the acoustic coagulation of aerosols formed in chemical production have good prospects of industrial application for the fine purification of gases.

V. A. Zhuzhikov reported on methods of theeretical analysis, experimentation and processing of experimental data which are adaptable to a study of filtration processes at any position of the filtrating barrier (in the presence of restricted sedimentation of suspended particles by gravity). In a communication by Ye. M. Gol'din (Leningrad) the results of a theoretical study were submitted concerning the motion of material in the rotor of a vibrating centrifuge, depending on various structural and technological parameters. S. Kaminskiy (Moscow) demonstrated designs of vibro-centrifuges interesting for industrial applications.

There was much valuable material in the communications concerning problems of heat exchange. One must note specially a paper by V. G. Aynshteyn, V. Ya. Kruglikov, N. I. Gelperin, I. B. Rapoport (Moscow) concerning heat exchange between a suspension (boiling) layer and the surface of a single tube in its longitudinal and transverse flow. N.I. Nikolayev and A. N. Planovskiy carried out an experimental determination of local coefficients of heat transfer from the surface of a horizontal tube to a pseudo-liquid layer of quartz sand. Dependences observed by N. K. Yelukhin, M. Ye Ivanov, and I. P. Vishnevyy in their study of heat exchange during condensation and boiling of O_2, N_2 and A are supplying a basis for designing condensors, evaporators, or air separating equipment and other apparatuses. A. B. Basel and A. S. Sakhiyev designed a jacked-tubular apparatus with helical fins inside the tubes. A study of heat transfer during condensation of gas-vapor mixtures in such condensers showed that in the presence of helical fins, the coefficient of heat transfer is twice as high as in smooth tubes. I. V. Mazyukevich (Leningrad) reported on experiments of heat exchange during NH_3 vapor condensation from a mixture with inert additives.

L. D. Berman (Moscow) submitted interesting experimental data giving a more accurate idea as to the mechanics of mass exchange, showing the nature and influence of the concentration of the active component, the difference of partial pressures and of surface shapes on the intensity of mass exchange.

There was a lively discussion after the report of T. K. Sherwood (U. S. A.) concerning a new theory of mass transfer which he worked out conjointly with Ryan for processes accompanied by chemical reactions. A. V. Lykov advanced the use of Onsager's theory for the study of heat- and mass exchange.

V. V. Kafarov (Moscow) submitted generalized equations of mass exchange, introducing a factor of dynamic surface state for different hydrodynamic regimes.

New experimental data on carry-away in plate apparatuses were submitted by Yu. V. Poplavskiy (Moscow). A. M. Rosen et al. studied the hydraulics and mass transfer on sieve "dip" plates of large diameter.

L. S. Aksel'rod (Moscow) and A. A. Noskov (Leningrad) investigated hydraulics and the efficiency of sieve rectification plates.

V. A. Malyusov, N. N. Umnik and N. M. Zhavoronkov (Moscow) investigated multistep molecular distillation.

Data obtained by L. L. Dobroserdov (Leningrad) concerning separation of azeotropic mixtures by salt rectification are of practical interest.

A. G. Usmanov (Kazan') after a study of the kinetics of molecular transfer in gases, derived a general kinetic equation for all molecular processes, formulated dependences for the transfer of velocity, heat and mass; and, based on the same, he generalized experimental data on viscosity, heat conduction and the diffusion of many gases and of steam. S. S. Traynina, M. E. Aerov and N. I. Nikitina (Moscow) reported on the application of the electrohydrodynamical analogy (EHDA) method to studies of chemical equipment. N. I. Gelperin (Moscow) investigated extraction from solutions in counterflow injection columns. A series of papers on the operation of extracting pulsating columns was submitted by S. M. Karpachevskaya, A. M. Rozen and others. Interesting data were obtained by S. Z. Kagan and M. E. Aerov (Moscow) in their studies of extractors provided with a mechanical stirring of the phases.

M. Yu. Lur'ye (Moscow) made propoganda for new methods of drying and reported on problems of drying techniques in the chemical industry.

In the four subsections of the section on organic chemistry more than 200 reports were submitted. The papers were many-sided: some of them were dedicated to the clarification of the mechanics of different reactions; others, to the improvement of already known processes, to the synthesis of new compounds necessary for the national economy, and to the research of more effective catalysts.

A series of reports by A. P. Nesmeyanov and his colleagues (Moscow) was dedicated to the development of the new chemistry of ferrocene.

Ye. A. Karpeyskaya, A. A. Tovstopyatova and A. A. Balandin (Moscow) showed that rhenium is a very effective catalyst for a series of organic reactions: the dehydrogenation of alcohols, of cyclohexane hydrocarbons, and of cuminol to α-methylstyrene.

Yu. G. Mamedaliyev (Baku) proposed a new technological process for the chlorination of hydrocarbons such as methane, ethane, propane, and butane, in a fluidized (pseudoliquid) catalyst layer. I. P. Tsukervanik (Tashkent) worked out a new method of condensation reactions splitting hydrogen halide by the use of metal powders as catalysts (Cu, Mo, W, Cr, Ti, Co Zr) rather than aluminum chloride.

In a series of works to be used new catalysts were proposed instead of mercury for the hydration of acetylene.

A series of articles considered the oxidation of solid parafines, of monocarboxylic acids into dibasic, and of ethylene into ethylene oxide.

Many reports were devoted to the chemistry of phosphoro-organic compounds, the vinylation of organic compounds, the destructive nitration of olefines, syntheses based on CO and H_2 and other problems of organic chemistry and technology.

At the meetings of the section on polymer chemistry and technology more than 80 papers were presented covering the preparation of new polymeric materials, the study of their behavior during processing and the alteration of properties of these polymers in desired directions.

Soviet scientists prepared new types of polymers: radioactive plastics which can be used as medical drugs and impulse generators, rubbers reinforced with synthetic resins, ion-exchange resins, heat-resistant silicorganic polymers containing aluminum and others.

V. A. Kargin, V. A. Kabanov and I. Yu. Marchenko (Moscow) obtained isotactic styrene with Vigler's catalyst. By radiographic and density measurements it was established that this polymer can be in both crystalline and amorphous states.

The thermomechanical curve of amorphous isotactic polystyrene is at its maximum in the temperature range of 100° to $150^{\circ}C$, moving with a change in the rate of rising temperature.

S. N. Ushakov (Leningrad) used more efficient "bonders" such as the diallylacetals of various aldehydes, methylene-bis-crotonamide and a diester of methylolcrotonamide (synthesized for the first time). The use of these compounds for copolymerization with methacrylic and vinyl esters makes possible the preparation of nonmelting and insoluble copolymers obtained by block polymerization.

Spatial bonding of vinylacetate and vinyl alcohol copolymers with crotonamide and methylcrotonamide are of practical importance for the production of new types of synthetic fibres of higher mechanical strength, of special materials for electro-vacuum engineering, insoluble modifications of polyvinyl alcohol for the preparation of benzo-

and water-resistant articles.

A. A. Vansheydt and N. N. Kuznetsova (Leningrad) reported on the condensation of phenoxyacetic acid with formaldehyde and on the synthesis of mildly acidic ion-exchange resins prepared therefrom. Tests have shown that phenoxyacetic acid reacts with formaldehyde in the presence of strong mineral acids, and meltable resins, soluble in aqueous alkali solutions, are formed when conditions are "soft"; under "hard" conditions and in an excess of formaldehyde, insoluble tridimensional polymers are formed which, besides carboxyls, also contain chlorine and phenol radicals.

When compared with KF4 resin, these cationates have half of its exchange capacity, but they show a great selectivity with reference to streptomycin and other large organic ions.

V. P. Zubov (Moscow) studied styrene polymerization in the presence of certain halides. Mixing of the components was achieved by their simultaneous evaporation under vacuum on a surface cooled with liquid notrogen. Plymerization took place during the thaw of "colloid ice" which formed on growing salt crystals.

It was shown that under these conditions the solid surface of such salts as $TiCl_3$ and $BeCl_2$ does not have any stereo-specific effect on the polymerization.

Stereospecific polymerization occurs only when the above salts combine with metal alkyls.

I. P. Losev and L. A. Datskevich (Moscow) synthesized and investigated polyesters of urethanes. These compounds are interaction products of diisocyanates and polyesters of high molecular weight obtained from dicarboxylic acids and glycols.

For synthesizing polyesters, carbon dioxide, succinic, adipic, sebacic acids, and ethylene-, 1,3-butylene-, 1,4-butylene-, diethylene-, and triethyleneglycol were used. Most valuable for the synthesis of urethane polyesters are polyesters the molecular weight of which is lower than 2,000. 1,6-Hexamethylenediisocyanate, toluylenediisocyanate and other diisocyanates were used for obtaining elastic materials.

Films were prepared from urethane polyesters which have valuable technical properties. The films obtained are entirely insoluble in any organic solvent.

V. V. Korshak, S. L. Sosin and M. V. Chistyakova (Moscow) showed the possibility of using free radical reactions with unsaturated compounds for preparing from them linear polymers, and they investigated the conditions and peculiarities of this /type of/ reaction.

K. A. Andriyanov (Moscow) reported on a new class of high polymer substances -- polyorganoaluminosiloxanes -- their

molecular chains being built of silicon, oxygen and aluminum. Synthesis of polyorganoaluminosiloxanes was based on phenyltrichlorosilane, ethyltrichlorosilane and aluminum chloride. Polymer properties were studied and conclusions drawn about the structure of polymer chains.

Z. N. Tarasova, M. Ya. Kaplunov, P. A. Klauzen, B. A. Dogadkin and V. L. Karpov (Moscow) investigated the kinetics of radiation vulcanization of some synthetic and natural rubbers, and the physicochemical and mechanical properties of vulcanizates prepared by radiation in an atomic reactor with Co^{60} as source and a total dose of 10^7 to 10^8 roentgens.

When compared with the best sulfur vulcanizates containing an equal quantity of fillers, radiation vulcanizates show a greater resistance to aging (four to five times at 130°C.), have a low residual deformation, low hysteresis, high endurance after multiple deformation, and higher wear resistance. The tensile strength of radiation vulcanizates does not reach that of the best sulfur vulcanizates.

The paper by Z. A. Rogovina and V. A. Derevitskaya (Moscow) gave the newest data on synthetic methods for new cellulose derivatives with polyuronic acid, on carboxymethylcellulose, and investigates properties of these compounds, as well as data on new polyuronic acid derivatives (alginic acid?) and carboxyl-containing cellulose esters (carboxymethylcellulose).

N. A. Glukhov (Leningrad) synthesized a series of organometallic chelates based on metal derivatives of acetylacetone and tetraketones of different structures. Zn, Mg, Cu, Ni, Co, Re and other metalloacetylacetonates were used as metal compounds. Synthesized polymers show a high fire resistance.

About 70 reports were submitted and discussed in the section on fuel chemistry and chemical technology. The work was done in two subsections: petrochemical and coaltechnology. Papers in these two sections covered major points of the chemistry and technology of combustion gases, petroleum, coal and shales.

A detailed report by V. P. Sukhanov (Moscow) dealt with problems of preparing high quality fuels and oils, as well as with problems of preparing from petroleum raw materials for polymer synthesis and for rubber and artificial fibre production.

N. M. Kravets reported on methods of the rational use of solid fuels.

N. V. Lavrov (Moscow) in his report on the outlook for the development and utilization of combustible gases showed what possibilities of industrial organic synthesis are opened by their processing into chemical raw materials,

in particular for producing acetylene, ethylene and other valuable products.

One must note an interesting study made in the Institut Nefti (Petroleum Institute) AS AzSSR by L. M. Kosheleva, S. D. Mekhtiyev, B. F. Pishnamezade, Sh. E. Eybatova, and F. A. Gashimova (Baku) with reference to the separation of cyclohexane and its nearest homologues from gasoline, distilled from Baku oil (Surakhan selected grade).

A. S. Fomina, L. Ya. Pobul' and Z. A. Degtereva (Tallin) studied the chemical nature of kerogen in Baltic kukersite shale. The results obtained constitute a new chemical method for processing kukersite shale into dibasic saturated acids, which are basic components for the synthesis of a broad assortment of chemical products.

The report by A. A. Kruglikov (Nizhniy Tagil) on the separation and utilization of dihydric phenols from semicoking and hydrogenation of Cheremkhovo coal is of importance for the future.

Of special interest is the preparation of epoxy resins by the condensation of dihydric phenols with epichlorohydrin in alkaline medium. Epoxy resins prepared by this method are not inferior in their properties to resins prepared from the difficult-to-obtain diphenylolpropane.

New methods of producing hydrogen from solid fuels were described by V. V. Lebedev (Khimki). These new methods are characterized by the compactness of installations, their high productivity, and they can be used in chemical production and in the oils and fats industry.

V. Ya. Kruglikova, I. B. Rapoport, A. V. Volynskiy and V. V. Muzovskiy (Moscow) devised theoretically and experimentally a highly productive synthesis of hydrocarbons from CO and H_2 over an iron catalyst in a fluidized and stationary layer (under pilot-plant conditions). The report indicated the possibility of long-duration steady functioning of catalysts in the conditions of the highly productive process.

A. D. Petrov, Ye. P. Kaplan, O. M. Nefedov and M. A. Cheltsova (Moscow) investigated the properties of individual polycyclic hydrocarbons of different types of structure and of C_{18} to C_{40} content. S. R. Sergiyenko, Ye. V. Lebedev and A. A. Mikhnovskaya (Moscow) obtained new data concerning the structure of petroleum hydrocarbons of high molecular weight. V. I. Isagulyants and V. N. Tishkova (Moscow) explained the scientific basis of the synthesis of alkyl- and arylphenolic additives to mineral oils and motor fuels. Van-Risselberg (Belgium) submitted interesting data concerning the oxidizability of oils.

N. I. Shuykin, N. G. Bekauri and G. N. Maslyanskiy (Moscow) submitted reports concerning catalytic isomerization

of paraffines resulting in improvements in motor fuels and in valuable initial products for the synthesis of rubber and other polymers.

Yu. L. Khmel'nitskiy, K. I. Zimina, A. A. Polyakova, and V. M. Nikitina (Moscow) presented interesting data on the radiolysis of various hydrocarbons. They worked out a mass-spectroscopic method of determining the structure-group content in gasolines. The method is based on the dependence of mass spectra on molecular structures.

M. A. Geyman and A. D. Larin (Moscow) synthesized a series of anionic surface-active substances from petroleum as well as from distillates of petroleum, brown coal, shale and peat.

Many Congress delegates took an active part in the discussion of the submitted papers. Certain problems caused interesting and lively discussions.

During the final meetings of the sections, decisions were taken indicating subjects of further research in the given areas of chemical knowledge. In many cases organizational problems were also discussed. So, for instance, the section on processes and equipment recommended the creation of an Institute of Processes and Apparatuses of Chemical Technology and of an Association of Engineers in this line -- within the system of the AS USSR. The section on agrochemistry suggested an increase in agrochemical laboratories and the creation of an Institute of Agrochemistry in the system of the AS USSR.

Soviet chemists are facing during the Seven-Year Plan multiple and prospective problems. For their fruitful solution the coordination of the work of scientific institutions and of production must be improved. The Congress directed attention to the necessity of increasing the role of plant laboratories, of widening the habit of cooperation among these laboratories, as well as of increasing the role of scientific research institutes and chairs of schools of higher education.

In a final plenary session of the Collective Organization of Soviet Chemists, those assembled at the Eighth Mendeleyev Congress addressed all chemists of the Soviet Union, summoning them to new creative research and work achievements for further development of chemical science and industry.

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